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# Course syllabus of industrial safety for management.

McMahan, Paul T.

Monterey, California: U.S. Naval Postgraduate School

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COURSE SYLLABUS OF  
INDUSTRIAL SAFETY FOR MANAGEMENT

PAUL T. MCMAHAN

COURSE SYLLABUS  
OF  
INDUSTRIAL SAFETY FOR MANAGEMENT  
by  
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//  
Lieutenant Commander, United States Navy

Submitted in partial fulfillment of  
the requirements for the degree of  
MASTER OF SCIENCE  
IN  
MANAGEMENT

United States Naval Postgraduate School  
Monterey, California  
1965

Library  
U. S. Naval Postgraduate School  
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COURSE SYLLABUS

OF

INDUSTRIAL SAFETY FOR MANAGEMENT

by

Paul T. McMahan

This work is accepted as fulfilling  
the research paper requirements for the degree of

MASTER OF SCIENCE

IN

MANAGEMENT

from the

United States Naval Postgraduate School

## ABSTRACT

Industrial safety is quite often envisioned by the public and college graduates in terms of safety slogans and posters. To offer a remedy to this deficiency in the academic career of college students, particularly those whose chosen endeavor will be the managerial side of industry, the course syllabus for industrial safety has been oriented towards emphasizing the ramifications of accidents in terms of litigation, costs, protection of employees, and employer responsibilities.

## FOREWORD

The title of this research paper will understandably convey the connotation that the contents are directed towards a course in the application of safety procedures. This is far from being the intent. As opposed to teaching safety methodology, the syllabus is oriented towards the psychology and philosophy of accident prevention; the ramifications of accidents in terms of legal implications and costs; and the growth of legislation regarding the protection of the employee and the responsibilities of the employer. This course syllabus is not designed to qualify one as a Safety Director but rather to aid the management student, the business student, the engineering student, etc. in understanding the ever-broadening responsibility of management towards accident prevention.

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CHAPTER I  
THE INDUSTRIAL SAFETY MOVEMENT

I Prior to the Industrial Revolution.

- A. A serious problem of work injuries was not apparent.
  - 1. Most work was carried on in the home or on the farm.
  - 2. Very little machinery existed and what did exist was not complicated.
  - 3. Families were to a large degree self-sufficient; hence, industry as we know today, did not exist.

II The Industrial Revolution.

- A. Public consciousness of the need for accident control was first awakened by the deplorable working conditions prevailing during the early years of the Industrial Revolution.
  - 1. People who had formerly used their homes as the "workshop" moved to the cities to work in factories.
    - a. The working conditions soon became crowded and hazardous.
      - (1) Large groups of untrained workers were exposed to moving gears, blades, etc. for the first time.
      - (2) Light, ventilation, aisle space, sanitation were not considered as necessity for proper working conditions.
      - (3) Employers did not concern themselves about the degraded conditions since labor was plentiful.
    - (4) Women and children were employed in large numbers.

- (5) Work days were twelve to fourteen hours long six days a week.

(6) Employers were not required by law to provide safety guards on machinery.

b. Victims of accidents had no recourse.

(1) It was possible to sue the employer on the grounds of negligence, but the burden of proof rested with the employee who could easily be defeated in court if the employer proved that the employee had contributed to the cause of the accident.

(2) Employers believed they owed no obligations to an injured employee.

2. First recognition of an employer's responsibility towards the employee was the passage of the Employer's Liability Law by Alabama in 1885.<sup>1</sup>

a. The laws were a step forward, but contained several loopholes which rendered them most ineffective. For example,

(1) Three so-called common law defenses usually provided the employer with sufficient defense against suits brought by the employee. They were entitled,<sup>2</sup>

(a) "Fellow-servant" rule which provided that an employer was not liable for injury resulting from negligence of fellow employees,

(b) "Contributory negligence" rule which provided that an employer was not liable if the injured worker's own negligence had contributed to the accident.

<sup>1</sup> Roland P. Blake (ed.), Industrial Safety, p. 13.

<sup>2</sup> Rollin H. Simonds, and John V. Grimaldi, Safety Management, p. 17.

(c) "Assumption of Risk" rule which stated that an employee accepted all "customary" risks of an occupation when he accepted the job.

3. Other early efforts contributing to the safety movement.

a. Other States began passing laws similar to the Employers' Liability Law.

b. Soon firms required the services of insurance companies for protection against possible law suits.

(1) Insurance companies employed engineers to inspect the insureds' establishments to evaluate accident hazards.

(2) In effect, the insurance company had entered the field of accident prevention and soon the value of their services was recognized.

c. Late in the nineteenth century, state legislative attempts to deal with industrial accidents took the form of factory inspection laws.

### III Workmen's Compensation Laws.

A. The first workmen's compensation law was passed by Maryland in 1902 followed by New York in 1910 and by 1915, thirty states had such laws.<sup>3</sup>

1. States initially claimed workmen's compensation laws as unconstitutional because,

a. Payments were made without regard to who caused the injury.

b. Payments were made without due process of law.

<sup>3</sup> Ibid, p. 18.

2. In 1917, the Supreme Court upheld constitutionality because of extreme degree of public interest involved.

IV Birth of the National Safety Council (NSC),

A. Its humble beginning started in 1912 when a group of engineers met in Milwaukee under the auspices of the Association of Iron and Steel Electrical Engineers to discuss accident costs, accident prevention, etc.<sup>4</sup>

1. In 1913, the same organization met in New York.

a. Name changed to National Council for Industrial Safety.

b. Safety activities were confined only to industrial accident problems.

2. In 1915, name of organization changed to National Safety Council.

a. Scope of activities broaden to include prevention of all accidents regardless of location, ie, industry, highway, home, school, etc.

B. The NSC is considered the most effective safety organization in the world.

1. Annual congress attended by over 12,000 safety and management personnel.

2. The congress is made up of sectional organizations called "Conferences" which aid the council staff in developing programs.

a. The "Conferences" constituents are safety personnel who specialize in particular fields of safety, for example,

(1) Communication industry.

(2) Automobile industry.

<sup>4</sup>Blake, op. cit., p. 15.

- (3) Rubber industry.
- (4) Petroleum industry.
- (5) Pulp and Paper industry.

## V Growth of Professional Safety Organizations.<sup>5</sup>

- A. American Society of Safety Engineers.
  - 1. Incorporated in 1915 and operated as a section of NSC.
  - 2. Withdrew in 1947 and became an independent organization with the aim of developing safety engineering as a profession.
- B. American Society of Mechanical Engineers.
  - 1. Originated in 1911 and has done significant work in developing safety codes for boilers and elevators.
- C. International Association of Industrial Accident Boards and Commissions.
  - 1. Dates back to 1914 and is concerned with the administration of workmen's compensation laws and the standardization of certain statistical methods.
- D. American Standards Association.
  - 1. Sponsored by NSC and functions to establish uniform standards, national in scope, in recording and measuring work injury experience.
- E. Above examples indicate the diversity with which the safety movement grew.
  - 1. Professional organizations now rendering safety service number in the hundreds.

## VI Growth of Safety within the Federal Government.<sup>6</sup>

<sup>5</sup>Simonds and Grimaldi, op. cit., p. 22, 23.

<sup>6</sup>Blake, op. cit., p. 17, 18.

A. Bureau of Mines organized in 1910.

1. One of its major functions was and continues to be a study of the causes for accidents and illnesses among miners.

B. Bureau of Labor Statistics Organized in 1913.

1. Among other things collects, tabulates, and disseminates statistical information about industrial injuries and health.

C. Bureau of Standards organized in 1910.

1. Works very closely with the American Standards Association in formulating safety standards and codes in industrial areas.

D. Division of Labor Standards, Department of Labor.

1. The objectives of the division, created in 1934, are,  
a. Formulation of labor standards in labor legislation and labor law administration.

b. Promote improvement of working conditions.

2. More specifically, this includes,

a. Development of safety codes in cooperation with the American Standards Association.

b. Furnishing safety and health consulting services.

c. Aiding states to train and improve their safety inspection personnel.

E. President's Occupational Safety Conference formed in 1948.<sup>7</sup>

1. Consists of committees representing industry, labor, insurance, and government personnel.

## VII Safety in a Changing World.

A. Social studies have long attributed many of man's ills and shortcomings to a constant cultural lag, to the inability of education to keep up with the rapid advances of civilization. New inventions, advanced

<sup>7</sup>Simonds and Grimaldi, op. cit., p. 23.

techniques, bring in their wake new standards and new objectives. Constant change and diversity continually call for new modes of adjustment and for reappraisal of objectives. This constant requirement for continuing adaptation has become a fertile area for studies in the social field. Consequently, it is felt that this syllabus should include discussions concerning both the philosophy and the psychology of safety prior to relating the economic aspect of safety to management. Hence, the following two chapters will discuss these topics in the aforementioned order.

## CHAPTER II

### THE PHILOSOPHY OF ACCIDENT PREVENTION

I What is the philosophy of industrial safety? The philosophy is a body of principles underlying the formulation of objectives and the establishment of a management vehicle, which will lead to accident free existence in the daily working environment of all employees.

A. Let's examine one of these basic principles, namely "Safety Consciousness" and its development. To begin with, it is an awareness of the necessity for forming a mental attitude within the employee's mind, which acts as a safeguard against his becoming involved in accidents and consequent injury.

The process is a gradual one built by repetitive training over a period of time, sometimes extending into years. Gradually, each act which the employee performs during the course of his work is calculated toward the accomplishment of his task with a minimum of exposure to danger. Ultimately, force of habit takes over so that the process becomes instinctive.

It is readily recognized that the new employee has little Safety Consciousness, therefore has greater tendencies toward accidents and injury. However, he is more amenable to safety training at this point than the older employee.

B. The principles underlying an accident free environment will be discussed by first noting the ten axioms which constitute the basic philosophy of accident prevention. Second, where deemed necessary, further elaborations, evidence, and/or explanations will be presented to convey the full significance of the principles.

## II The Ten Axioms.<sup>1</sup>

A. The occurrence of an injury invariably results from a completed sequence of factors -- the last one of these being the accident itself. The accident in turn is invariably caused or permitted directly by the unsafe act of a person and/or a mechanical or physical hazard (see section III).

1. The preciseness with which an accident can occur or fail to occur is illustrated by the following example which is an actual accident case.

An underground cable splicer was attaching a clip lead to a pole ground during the course of electrolysis checks. As he attached the lead, lighting struck the overhead circuit burning it down. The transient voltage generated momentarily in the ground wire caused first and second degree burns on the right hand of the workman. Although not a serious injury, this accident could have been a fatality had certain other conditions been just right. However, a small fraction of a second either way and no injury would have occurred.

B. The unsafe acts of persons are responsible for a majority of accidents.

1. An example is the air conditioning mechanic who admitted that he had habitually reached close to a revolving fan in performing some repair work. Eventually his attention was momentarily distracted and his hand caught in the moving blades.

<sup>1</sup>H.W. Heinrich, Industrial Accident Prevention, p. 13, 14.

C. The person who suffers a disabling injury caused by an unsafe act, in the average case, has had over 300 narrow escapes from serious injury as a result of committing the very same unsafe act (see section IV).

1. This doesn't mean that the employee has no injuries within the scope of "300 narrow escapes" but rather that he was lucky enough to escape a serious injury for a period of time.

2. The disabling injury is not necessarily the result of the SAME unsafe act but rather SOME unsafe act.

D. The severity of an injury is largely fortuitous -- the occurrence of the accident that results in injury is largely preventable.

1. The degree of injury in a given accident is not controlled to any great extent. However, well trained employees in the art of rescue and first aid may materially lessen the degree of the resulting injury. One accident may produce no injury while the next similar accident may cause a fatality.

E. The four basic motives or reasons for the occurrence of unsafe acts provide a guide to the selection of appropriate corrective measures (see section V).

1. Good attitudes, loyalty, sincerity, and willingness to learn are powerful deterrents of accidents. An employee willing and anxious to learn will have fewer accidents. His mental and physical skills develop more readily, building his degree of safety consciousness.

F. Four basic methods are available for preventing accidents -- engineering revision, persuasion and appeal, personnel adjustment, and discipline (see section V).

G. Methods of most value in accident prevention are analogous with the methods required for the control of the quality, cost, and quantity of

production (see section VI).

H. Management has the best opportunity and ability to initiate the work of accident prevention, therefore it should assume the responsibility.

1. As the result of injuries in an electric shock and burn case, an employer has spent more than \$31,000 in medical costs alone in endeavoring to bring the employee back to maximum possible recovery. Today, several years later, the employee is more than 50% disabled and his earning power cut more than 50%.

2. To management today, its employees are by far its most valuable asset. Investment of a very few dollars in safety training per employee can easily save several times the training cost. An annual cost of \$100,000 for a group of 2500 employees can easily prevent accidents costing several times greater.

I. The supervisor or foreman is the key man in industrial accident prevention. His application of the act of supervision to the control of worker performance is the factor of greatest influence in successful accident prevention. It can be expressed and taught as a simple seven step formula (see section VII).

1. Any accident prevention program must have as its broad base the cooperation of the foreman. He is the man who if he applies himself to the study of his men, will know, for example, when the employee's little girl is seriously ill. He is the supervisor with sufficient wisdom to detect and become sensitive to changes in the employee's emotions, which may throw an employee's ordinarily careful work completely off balance and produce an accident.

2. Several years ago, an employee for a utility company was killed while removing the grounding wire from a high voltage transmission

tower. There is a very definite sequence for removing ground wires.

This particular employee had attempted to remove the ground wire in REVERSE sequence.

During the investigation, the foreman testified he had noticed that the employee was not "acting his usual self" and that instead of eating lunch, the employee had chosen to use the time in placing a telephone call. It was later learned that the employee had called his wife to check on the condition of his child who was seriously ill with pneumonia.

J. The humanitarian incentive for preventing accident injury is supplemented by two powerful economic factors: (1) the safe establishment is efficient productively and the unsafe establishment is inefficient; (2) the direct employer cost of industrial injuries for compensation claims and for medical treatment is but one fifth of the total cost which the employer must pay (see section VIII).

### III The Accident Sequence.

#### A. The Five Factors in the Accident Sequence are,<sup>2</sup>

1. Ancestry and social environment.
2. Fault of person.
3. Unsafe act and/or mechanical or physical hazard.
4. Accident.
5. Injury.

The occurrence of a preventable injury is the culmination of the above listed events or circumstances, which invariably occur in a fixed and

<sup>2</sup>Ibid. p. 17.

logical order. One is dependent on another and one follows because of another, thus constituting a sequence that may be compared with a row of dominoes placed on end and in such alignment that the fall of the first domino precipitates the fall of the entire row. The accident is merely one factor in the sequence. If the series is interrupted by the elimination of one of the above listed factors, the injury cannot occur.

B. Practical application of the five factors.

1. Knowledge of the factors in the accident sequence guides and assists in selecting a point of attack in prevention work.

2. The factors in the accident sequence constitute an index of the kind of information the accident preventionist must deal with if he is to perform his work efficiently.

IV The Foundation of a Major Injury.

A. A study of over 5000 accident cases revealed that for every mishap resulting in an injury, there are many other similar accidents that cause no injuries.

1. More specifically, it was determined that in a unit group of 330 accidents of the same kind and involving the same person, 300 of the accidents result in no injuries, 29 in minor injuries, and 1 in a major lost time injury.<sup>3</sup> Of course, these are average figures.

B. The 300-29-1 ratio, an aid in accident prevention.

1. Viewed as an aid in accident prevention, the ratio is significant because it vividly emphasizes preventive opportunities.

V Reasons for Unsafe Habits.

<sup>3</sup>Ibid, p. 26.

A. The method whereby unsafe acts are to be corrected is most effective when it suits the reason for the occurrence of an unsafe act.

1. The reasons for unsafe acts may be placed under four general headings,<sup>4</sup>

- a. Improper attitude.
- b. Lack of knowledge or skill.
- c. Physical unsuitability.
- d. Improper mechanical or physical environment.

For example, employees were continually violating company safe practice rules relative to washing before eating luncheon. All efforts in the way of instruction, supervision, and education had failed to produce results. When the reason for the unsafe act was found, it developed that the washrooms were uncomfortably drafty and that the water was cold. In short, the unsafe act was committed largely because it was inconvenient and uncomfortable to follow the safe practice.

2. The important points to be made are,

- a. Definite causative factors lie directly behind the occurrence of unsafe acts.
- b. The causative factors are few in number and normally easily identifiable.
- c. The causative factors are extremely valuable as direct clues to the selection of corrective action.

B. From the foregoing, it is clear that remedial action in

<sup>4</sup>Ibid, p. 38

accident prevention may be grouped into four classifications,<sup>5</sup>

1. Engineering revision - Guarding, redesign, relocation, etc.
2. Persuasion and appeal - Instruction and reinstruction in safe practices.
3. Personnel adjustment - Reassignment of workers.
4. Discipline - Mild reproof, admonition, penalties, etc.

## VI Analogy between Methods of Controlling Accidents Causes and Production Faults.

- A. The control of quality and quantity of product and of the frequency and severity of accident occurrences, have much in common.
1. In many cases, the faulty practice involved and the reason for existence of the fault, sponsors both accident occurrence and unsatisfactory production.
  2. In many cases, the best method to correct an unsafe practice is identical with managerial and supervisory methods which would be used if the practice were not unsafe but was one that resulted in high cost production.

## VII Formula for Supervision.

- A. Management has long recognized the vital status of its key people, namely the supervisors and foremen, for,
1. It is the immediate supervisor who has direct control of worker performance and the maintenance of environmental conditions in so far as these affect the quality and volume of production and the safety of personnel. However, paradoxical as it may appear, "supervision" is

<sup>5</sup>Ibid.

not being taught as an art that is subject to specific definitions and rules of application.

a. Instead, "supervision" is described, preached, stated as a necessary element, philosophize, etc., but the question of "how" usually remains unanswered. What was needed was a simple formula - one that could be applied to any and all supervisory situations. Such a development known as "The Scientific Method Applied to Problem Solving", sets forth a seven step problem solving procedure. Although the steps, as noted below, may not be exactly applicable to every situation, the author's logical systematic approach, and the questions posed to ensure each factor is adequately researched, leaves no doubt that every parameter of the problem should be explored.<sup>6</sup>

#### STEP I WHAT ARE THE FACTS?

Where is the evidence?

Have I examined all sides of the issue?

Am I dealing with facts or assumptions?

Do I have the right answers to WHAT? WHY? WHERE? WHEN? WHO?  
HOW?

Is this a problem subject to qualitative and/or to quantitative measurement?

#### STEP II REDEFINE THE PROBLEM!

What is the immediate or critical incident?

What is the real deep seated, underlying cause?

Can we treat the problem at the source?

<sup>6</sup>Wm. Howard Church, "The Scientific Method Applied to Problem Solving," (Monterey, Calif., U.S. Naval Post Graduate School), mimeographed.

STEP III      WHAT MANAGEMENT PRINCIPLES, LAWS OR CRITERIA APPLY TO THIS CASE?

Which criteria have been violated?

What list of criteria and management policy could prevent the recurrence of this problem? What other criteria could one recommend that would anticipate and help prevent other management problems in this organization or in this case study?

STEP IV      WHAT ARE THE POSSIBLE COURSES OF ACTION?

Higher authority may need several alternatives. Which ones have maximized results while having the least number of undesirable effects or consequences?

STEP V      WHAT HUMAN FACTORS ARE INVOLVED THAT CAN HAVE FAR REACHING CONSEQUENCES ON MORALE AND EFFICIENCY?

Have we analyzed the "Zone of Acceptance" of every group or individual concerned in terms of proposed recommendations?

STEP VI      WHAT WILL BE THE ULTIMATE CONSEQUENCES OF THE DECISION OR COURSE OF ACTION RECOMMENDED?

Let's have a trial run!

Let's be willing to change and start over if a plan is tried and does not work!

STEP VII      TAKE ACTION. BUT IF WE WANT RESULTS, WE MUST BUILD SUPPORT AND ACCEPTANCE. THERE MUST BE BASIC UNDERSTANDING OF THE DESIRABILITY OR NEED FOR SUCH ACTION!

Then, let's follow through to see that the desired results are obtained!

## VIII Costs of accidents.

A. To some executives, the costs of accidents are looked upon only in terms of the compensation paid the employee. Unfortunately, this is non-recognition of the fact that accident prevention is an essential element of sound business management.

1. Annual estimates of industrial accidents are stated in terms of millions of dollars and are usually based upon the loss time of the injured

and medical expense. These expenses are considered the employer's loss inasmuch as the employee is partially compensated.

a. The remaining additional cost has been found by research to be four times as great.<sup>7</sup>

b. Stated another way, compensation and medical payments constitute only one-fifth of the total employer accident cost.

B. Examples of Hidden Cost.

1. The calculations from which the above 4 to 1 ratio was derived were based on examples of cost such as follows. The list is not meant to be complete but only indicative.

a. Cost of lost time of injured employee.

b. Cost of lost time by other employees who stop work for reasons of curiosity, sympathy, etc.

c. Cost of time lost by foremen, supervisors, and other management levels for purposes of assisting, investigating, arranging for replacement, preparing accident reports, etc.

d. Cost of damage done to machinery.

e. Production loss.

C. Development of Cost Centers.

1. Cost centers are normally employed to measure production efficiency of one department or a homogenous unit of work processes.

a. This action only results in partially reflecting the cost of production.

b. The omission is cost of accidents.

2. Develop cost centers which will diagnose both production and

<sup>7</sup>Ibid, p. 50.

costs.

a. For purposes of standardization, develop an index of "most likely" types of accidents.

b. Integrate both production and accident costs to reflect the "true" efficiency.

3. Cost centers perform a two-fold purpose.

a. It permits top management to know who is out of line cost-wise.

b. It stimulates a supervisor to take an entrepreneur attitude toward his area of control.

IX As noted previously, philosophy is not the only social science supporting and guiding the selection and application of accident-preventive methods. Psychology also plays an equal part. Whereas philosophy includes recognition of fact, the finding of reasons or causes, and drawing conclusions, psychology seeks to explain the human behavior associated with each step of the accident control program. The following chapter shall be concerned with the latter area.

## CHAPTER III

### THE PSYCHOLOGY OF ACCIDENT PREVENTION

#### I Psychology and the Safety Engineer.

A. Opportunity exists for professional psychology to be introduced much more into the field of practical accident prevention. Evidence continually accumulates indicating the need for accident control measures based on better knowledge of human behavior. The successful accident preventionist, although probably untrained and inexperienced from a trained psychologist's viewpoint, continually applies psychological methods in his work.

1. The safety engineer endeavors to sell safe methods realizing that unsafe actions of persons predominate in accident causation.

2. The safety engineer endeavors, when simple and direct remedies fail, to find out why the unsafe action persists.

B. Suggestions as to what the psychological profession might do to assist in accident prevention are given in the following paper.<sup>1</sup>

It is an understatement of considerable depth to say that the practical application of psychology to industrial problems lacks full appreciation by industry. Safety engineers, however, agree that psychology has a place of considerable importance in accident prevention. They are not psychologists but their profession demands that they deal with persons. Clearly this is required because the great majority of accidents are caused by the unsafe acts of persons. Without some knowledge of psychology they are limited in this phase of their work to finding what particular unsafe acts require correction, and then, more or less arbitrarily, to depending on engineering, supervisory control, enforcement, and education for the remedy.

The psychologist could be of tremendous assistance in corrective or preventive action if he would step into the picture and suggest some way whereby the safety engineer may determine why persons act unsafely and what is practical to do about it. An approach of this nature might well lead eventually to the more general acceptance by management of the idea that an industrial psychologist should be included as a member of the plant staff just as a physician is already so included.

<sup>1</sup>H. W. Heinrich, Industrial Accident Prevention, p. 171.

Pending the time when the psychologist teams up with the safety engineer and plies his profession more frequently in the average industrial establishment, there is a way he can create a much wider and quicker acceptance of industrial psychology as a practical aid in safe and efficient production.

This lies in the conversion of the applicable principles of psychology to lay language. For ready understanding by the engineering fraternity the factors involved might be set up somewhat as shown by the items in columns A, B, and C, as in the accompanying table.

A. Known unsafe performances or actions	B. Probable immediate personal causes	C. Possible psychological subcauses or causative backgrounds
1. Unconsciously violates safe-practice rules.	1. Inexperienced.	1. Impulsive, intolerant, adventurous.
2. Destroys, cheats, mis-adjusts safety devices.	2. Lacks full appreciation of danger.	2. Feeling of insecurity or anxiety.
3. Quarrels with others.	3. Fatigued, physically unsuited, or below par.	3. Inconsiderate, destructive, jealous.
4. Fails to warn others.	4. Inattentive, absent-minded.	4. Not recognized or appreciated.
5. Undertakes tasks beyond mental capacity.	5. Exaggerated sense of humor.	5. Abnormal ambition, disappointment over advance.

(TABLE NOT COMPLETE)

The items in column A represent the several kinds of unsafe action that concern the safety engineer. He is on sure ground thus far. He knows and can determine what persons do unsafely.

Column B represents the engineer's attempt to set up the probable and immediate causes or reasons why unsafe personal action is taken. Here the safety engineer gets a bit beyond his element. He has no set of guiding rules. He uses his judgment and what he happens to know of human nature.

When it comes to the items in column C, the engineer is in even deeper water. These items are intended to represent the underlying causative factors. In other words, they are what the engineer believes to be the reasons why the immediate causes (column B) exist and ultimately why the latter, in turn, cause or permit unsafe practice.

As can be seen, the three columns constitute a sequence of cause and

effect items. Those in B and C are probably far from correct or all-inclusive. Practical experience however has shown that many of them fit individual cases nicely. In any event it is not the exact content but rather the frame-work that is advocated herein.

• • • • • • • • • • • • • • • • •

C. The following is an example of an actual accident which had as a basis an underlying causative factor that was not readily apparent until after considerable investigation.

1. Several years ago an electric power line installation crew was setting a pole. A manually operated type of A-frame, with the middle stiff leg assembled in three sections, was being used. In assembling the middle stiff leg, the truck driver inserted the pin through the middle section of the leg and behind the end of the bottom section rather than through the hole in the bottom section. The middle leg was attached to the truck bed and the tension released on the winch line. The pin having been inserted improperly allowed the A-frame to fall striking a man on the head and breaking his neck. The employee survived but at a great deal of cost to both he and the firm.

2. The superficial cause of the accident was simple - improper insertion of the pin. The underlying causative factor was revealed only after extensive probing. The night before the accident, the truck driver's wife had gone horse-back riding with a male companion and did not return until the early hours of the morning. Upon her return, a very unpleasant situation followed. As a result, the man was emotionally upset.

## II "Carelessness, Recklessness, and Bad Luck" - Their Use and Abuse.

A. Individuals have been prone to ascribe accidents to one of these non-descriptive terms, but are these the real causes or are they

merely apparent causes? Accidents do not just happen.

1. Every accident has one or more reasons.

2. The causes may be external to the individual or they

may be within him.

3. Or, they may arise from both external and internal sources.

B. The above terms, and other similar ones are usually emphasized as the most important of the causes which lie within the individual.

However, these words explain little and in fact, misrepresent the causes of accidents. For example.<sup>2</sup>

1. Consider the worker at a grinding wheel who injured his eye because he did not wear goggles which were given to him. One would be inclined to say that he was careless, but was he? Assuming normality, he would care very much for his eyes. Then what caused the accident? It may have been a desire to show off -- to be a tough guy who didn't need goggles.

2. Or, what about the man working at a soldering bench who burns himself often because he has arranged his work so that his arm must pass over heated objects. It might be said that he is careless, but the inner reason is probably that he never thought well enough to set up his work in an orderly manner.

C. It becomes readily apparent that such adjectives as "careless" or "reckless" as given cause of accidents, neither describes, defines, nor implies a phenomenon of human behavior which would be useful in determining a correction for the cause of accidents.

1. Instead, the use of such non-descriptive words to account for reasons of an accident is analogous to tossing a blanket over the

<sup>2</sup>Rollen H. Simonds and John V. Grimaldi, Safety Management, p. 397.

accident facts, which,

a. Obscures the truth and permits the loss of accident facts.

b. Permits the assumption to arise that accident causation has been determined.

2. The truth is that in every case where an accident cause lies within the individual and is ascribed to one of the aforementioned words, it is really thoughtlessness which is normally responsible. The ascription of accident occurrences to thoughtlessness means that corrective action is feasible by:<sup>3</sup>

a. Improving habits through,

(1) Defining the desirable habits to be acquired.

(2) Practicing the desirable habit at every opportunity.

(3) Creating opportunities for practicing the desirable habit.

(4) Allowing no exception to occur.

b. Training.

c. Increasing the power of concentration. Factors contributing to reduced powers of concentration are:

(1) Too many interests.

(2) Lack of interest within job.

(3) Worry and fear.

(4) Negative factors within organizational climate.

(a) Excessive noise, poor interrelationship

between employee and employer, inadequate heat, light, etc.

<sup>3</sup>Ibid, p. 398.

3. The word thoughtlessness has another application deserving of consideration and more than often overlooked by the layman. This application is related to the highly trained, highly skilled, sincere, well oriented employee who becomes involved in an accident. This is especially frequent in vehicle accidents and often involves top executives. In the case of vehicle accidents, their minds are busy working on many problems and are paying little or no attention to their driving. This explains the often repeated comment that a moron makes a better driver than a bank president. He has his mind on only one problem, namely, his driving. This helps to explain why the highly skilled employee of many years experience sometimes becomes an unsafe workman.

### III Accident - Repeater and Accident - Proneness.

A. An early and still existing view in some safety literature is that there is a real difference between an accident repeater and a person who is prone to have accidents, or as described by one author, accident-proneness implies a predisposition to or propensity for accidents.<sup>4</sup>

1. More recently accident proneness has been used as an explanatory term for an individual's repetitious accident experience. This newer use of the term is as misleading as such words just previously described.

a. Being used as a cause of accidents, "accident-proneness" tends to cloud the accident facts.

2. If a person continually has accidents, the reasons will

<sup>4</sup>Herbert J. Stack and J. Duke Elkow, Education for Safe Living, p. 48.

probably be related to either,

- a. Physical or mental make-up.
- b. Or to the environment in which he works.

Consequently, the use of the term "accident proneness" is, in general, subject to objection.<sup>5</sup>

B. The better term to use in indentifying personnel who experience recurring accidents is "accident repeater"<sup>6</sup> because,

1. It describes only the relative status of a individual's accident record.

2. It avoids the connotation that a person possesses an incurable causative deficiency.

3. It requires that a search be instituted to locate the "real" reason.

4. It also indicates a controllable situation. For example, an automotive mechanic climaxed a series of accidents in which he had been involved by running two fingers through a set of gears. Due to the increasing frequency and severity of his accidents, two members of management, with the knowledge of the foreman, reviewed with the employee his accident record pointing out the dangers of his increasing accident rate. The result of this meeting was a promise on the part of the employee to improve. That was fifteen years ago. He has never had an accident since. He is now foreman and the men he supervises do not have

<sup>5</sup>Simonds and Grimaldi, op. cit., p. 400.

<sup>6</sup>Ibid.

accidents.

C. A report based on a study of a consecutive series of 35,000 accident cases indicates that the accident repeater is not a significant factor in the safety problem. The study reported that:<sup>7</sup>

1. Persons who consistently experienced injuries annually over a period of three years accounted for only a small percentage of all the accidents studies (0.5 per cent).
2. Most of the accidents (74 per cent) were due to "relatively infrequent solitary experiences" of a significantly large group of persons (86 per cent). An interesting observation was made that the percentage distributions were the same for the occupational as well as nonoccupational accident groupings and did not vary for most of the years over a 20 year period.
3. Accidents, in the groups studied, occurred most frequently to persons in the age group of 20-24 at a rate two and one-half times greater than that for persons aged 40-44, four times greater than at the age of 50-54, and nine times greater than at 60-64. This prevailed similarly in both the occupational and nonoccupational groups. It would appear that the susceptibility to having accidents disappears with increasing age. Schulzinger did not discuss the comparative severity of accidents suffered by the younger group as opposed to the older groups. But it might be assumed that the older the person, the more severe the effects of a similar accident would be and that this would be most evident for the age groups past 50 years.

#### IV Questionable Causes of Accidents.

A. Reaction Time. It may appear quite logical to hypothesize that reaction time would have a significant influence on a person's ability to avoid accidents. The evidence is somewhat disputable, however, there appears to be a prevailing opinion that reaction time has no important relationship to accident causation.<sup>8</sup>

B. Relationship between Perception and Muscular Responses, and

<sup>7</sup> Ibid, p. 401, citing M.S. Schulzinger, "Accident Proneness", Industrial Medicine and Surgery, Vol. XXIII (April, 1954), p. 151-52.

<sup>8</sup> Ibid, p. 402, citing E. Farmer and E.G. Chambers, A Study of Personal Qualities in Accident Proneness and Proficiency, Report No. 55, (London: Industrial Health Research Board, 1929).

accidents. It was found that persons who tend to react more quickly than they perceive are more likely to have accidents than are those who perceive faster than they react.<sup>9</sup>

C. Relationship between Intelligence and Accident Experience.

There have been contradicting studies as to whether or not a correlation exists between accident repetition and level of intelligence. This disagreement has been explained by the realization that a definite minimum intelligence is required to avoid accidents and that the minimum critical intelligence may be a function of the complexities associated with the job.<sup>10</sup> It appears doubtful if any relationship exists between intelligence and accident experience above the minimum level considered necessary to do the job. Hence, mental ability tests might be used to identify employees with extremely low abilities.

D. Age. Studies have indicated a declining accident rate as the age increases.<sup>11</sup> This is probably attributable to increase in experience and a probable decrease in irresponsibility, impulsiveness, etc.

V Learning.

A. Learning underlies most of what makes for differences and similarities among people. Through learning, people developed certain

<sup>9</sup> Ibid, p. 403, citing C.A. Drake, Personnel Selection by Standard Job Tests (New York: McGraw-Hill Book Co. Inc., 1942).

<sup>10</sup> Ibid.

<sup>11</sup> Ibid, p. 404, citing M.S. Schulzinger, "Accident Proneness," Industrial Medicine and Surgery, Vol. XXIII (April, 1954), p. 151-52.

kinds of habitual patterns of behavior, ways of reacting to emotion, and attitudes which are brought with the employee to industry. The question of learning and the laws which affect it are vital tools for the safety engineer.

The safety engineer must also keep in mind that if the workers are going to learn safe procedures, they must be so motivated. It is not safe to assume that because management sees the value of safe procedures the worker will also. Management may be motivated to start a safety program because of insurance reduction costs, reduction of waste, and an increase in production. Workers will not necessarily desire it for the same reasons. In selling a safety program to employees, one must capitalize on things which will motivate them.

B. The motivation plus the necessity for changing certain undesirable habitual patterns of behavior is developed through the application of the basic laws of learning. These laws are as follows:<sup>12</sup>

1. Law of Use.

a. Safety lessons must be stressed over and over to the point that safe habit patterns become almost automatic in work methods. This requires not only training sessions but "follow-up" on the job by the foreman.

2. Law of Disuse.

a. This is the reciprocal of the law of use.

b. In terms of the psychologist, this law states that if a connection between a stimulus pattern and a response is not exercised during a period of time, the strength of the connection decreases.

<sup>12</sup>Stack and Elkow, op. cit., p. 51.

c. In terms of the laymen, if safety education is hazard without any planned continuing program, the desired consequences of Rule One will never materialize.

3. Law of Effect.

a. This law states that individuals tend to repeat those responses that are satisfying.

b. This means that through the establishment of a reward system, eg, recognition by presenting safety awards, paying bonuses, etc, the latter becomes the vehicle by which the employees will try to duplicate the behavior which gave them the initial reward.

c. Publicity should be given to the reward system and the reward should closely follow the behavior being rewarded.

4. Law of Primacy.

a. This law states that first experiences are more likely to be retained than latter experiences.

b. The worker's initial contact with safety procedures should be one of major importance.

c. Don't give a new employee a book of rules and say "learn them," creating an air that safety is not really important.

d. The worker must get the impression that not only are the rules important but so is the entire program. This will help ensure the positive response desired.

e. There should be "follow-through" by the foreman to make certain that the employee has no opportunity to work other than by the safe method.

f. His training must be right from the very beginning.

5. Law of Recency.

a. This law states that recent experiences are more likely to be retained than remote ones. Or, the more recent the exercise of a connection between stimulus pattern and response, the stronger the connection will be.

b. This principle is exercised by devising means which give workers constant contact with applicable safety procedures through activities such as contests, reviews of safety regulations, and committee work.

#### 6. Law of Vividness.

a. This law states that a vivid experience is more likely to be retained than one that is not vivid.

b. This principle requires dramatization of the safety program, eg, eye-catching posters, slogans, etc. Those learning experiences made the most vivid will be retained the longest.

c. This law in effect states "Let's dress up the safety program in the same way that advertisers dress up their commercials to catch the public's attention." <sup>13</sup>

VI Men, machines, and materials are three of the basic components of industry. They all can be employed for safety. However, there is one distinction. Machine and materials can be controlled but the human factor must be guided in the interests of accident prevention. This "guidance" is not a mission singularly handled by the safety director. The manifested interest must commence with the top echelon and terminate with the employee, with the foremen playing a key role of providing the

<sup>13</sup> Accident Prevention Manual for Industrial Operations, 5th Edition, p. 5-24.

feedback necessary for the change of behavior, introduced by the safety director, to become effective. Only after realization that "Safety is Everybody's Business" can a safety program become fruitful and a dividend paying enterprise.

## CHAPTER IV

### THE GROWTH OF WORKMEN'S COMPENSATION LAWS

#### I The Evolution of Work Injury Compensation.

##### A. Common Law Rules.<sup>1</sup>

1. To provide a reasonably safe work place.
2. To provide reasonably safe tools and equipment.
3. To use reasonable care in selecting employees.
4. To enforce reasonable safety rules.
5. To provide reasonable instruction regarding the dangers of the employment.

##### B. Ineffectiveness of Common Law Rules.

1. These laws were the first legal vehicle by which employees could seek financial compensation from employers for reasons of personal injury. However, there were disadvantages which almost completely nullified the efforts of the employees.

a. To receive compensation, the laws required that the employee bring a personal injury suit against his employer. This procedure was not conducive to continuing compatible relationships between the employer and the employee.

b. The courts of the latter half of the nineteenth century interpreted the rules strictly and the employee rarely recovered damages.

c. The employers effectively employed the use of the "Common Law" defenses (noted in Chapter I) against the personal injury suits of employees.

<sup>1</sup> Accident Prevention Manual for Industrial Operations, 5th Edition p. 11-29.

Statistics indicate that approximately 40% of the industrial accidents were attributable to deficiencies on both the part of the employee and the employer. It has been estimated that an additional 30% of accidents was due solely to the fault of the employee. Therefore, because of the "Common Law" defenses, approximately 70%<sup>2</sup> of all disabilities were not compensated under the Common Law System.

C. Employers' Liability Laws.

1. These laws were a second attempt to give the employee a legal vehicle by which he could receive compensation for injuries occurring at his place of employment.

2. The Employers' Liability Laws' primary gain was the dilution of the effectiveness of the employers' use of the Common Law defenses.

3. Although the employee had made a step forward, he was still in the position of having to initiate the action to recover damages, ie,

a. The injured worker still had to bring a lawsuit for damages against his employer, assuming that private negotiations did not result in a satisfactory settlement.

D. Workmen's Compensation Laws.

1. The first workmen's compensation act was a German law enacted in 1884, which was a self-supporting insurance plan under government supervision.<sup>3</sup>

2. As noted in Chapter I, the first workmen's compensation law passed in this country was by the state of Maryland. This was

<sup>2</sup>Ibid.

<sup>3</sup>Ibid.

followed by a Federal Government compensation law in 1908. By 1915, thirty states had some type of compensation law.

3. These early laws encountered the problem of constitutionality primarily on the grounds of,

a. Violating the 14th Amendment to the Constitution, which prohibits taking a person's property without due process of law.

4. To by-pass the rulings of courts, various state legislative bodies passed elective laws which,

a. Granted both the employer and the employee the right to decide whether or not each wished to come under the act.

b. Presumed the employer or employee to come under the act unless a petition to the contrary was filed prior to the occurrence of an injury.

5. Upon the United States Supreme Court declaration that workmen's compensation laws were within the meaning of the Constitution, states began passing compulsory laws for certain areas of employment with penalties imposed for non-compliance. To date, compensation laws have been enacted in all fifty states,<sup>4</sup> in two federal jurisdictions, in Puerto Rico, and in the District of Columbia, which brings to a total a sum of fifty-four different compensation systems used in the United States.

## II The Compensation Principle.

A. With the advent of the Supreme Court ruling,

1. The employer surrendered his right to insist on proof of negligence, and

<sup>4</sup>Earl F. Cheit, Injury and Recovery in the Course of Employment, p. 12.

2. Labor surrendered its right to sue for unlimited damages.

Consequently, compensation laws eliminated liability based solely on proof of the employer's negligence and substituted for it a system of liability regardless of the employer's fault. Employers are held liable not on the basis of fault or negligence but on the basis of social policy.

B. The principle underlying compensation law is that liability for industrial accidents is one of the costs of operating a business therefore, such costs should be transferred from the worker and the employer to the consumer.<sup>5</sup>

### III Summary of Compensation Laws

#### A. State Laws.

As previously noted, to circumvent the constitutional objection to compensation laws prior to the 1917 Supreme Court ruling, many state laws were made in whole or in part, elective. Although obsolete this provision of "electiveness" still remains in nearly one half of all state compensation laws. Thus, when an employee or employer fail to elect coverage and the law does not presume it, a worker may not be protected by the compensation act. For this reason and because of other exemptions and exceptions, wide variations exists from state to state in covered employment as a percentage of eligible employment, eg,<sup>6</sup>

1. At one extreme, compensation laws of six states reach 90% or more of the potentially eligible employees.

2. At the other end of the scale, there are seven states

<sup>5</sup> Accident Prevention Manual, op. cit., p. 11-3.

<sup>6</sup> Cheit, op. cit., p. 16.

whose laws reach less than 60% of the potentially eligible employees.

3. Over half of the states have laws which reach more than 70% of the potentially eligible employees.

Although each of the fifty-four compensation laws employ fairly similar principles in their approach to establishing liability and eligibility for benefits, there is considerable difference from jurisdiction to jurisdiction as to administration, benefits paid, etc.

Some of these differences are as follows:<sup>7</sup>

1. Although most injuries are covered, many occupational diseases are not. About two-thirds of the jurisdictions provide blanket coverage of all diseases. The other third enumerate specific diseases that shall be compensated. There are two states which do not compensate for occupational diseases.

2. Medical benefits are paid in full for both accidental injuries and occupational diseases in about two-thirds of the jurisdictions. The remaining jurisdictions either provide a duration or dollar limit.

3. Wide ranges exists in weekly benefits for permanent disability (from \$28 in Idaho and Montana to \$150 in Arizona).

a. Some jurisdictional benefits are payable for life, but most are limited.

4. There is great divergence in survivors' benefits in cases of occupational death.

5. In some states, the administering agency is merely an adjudicating agency, whereas in others, the agency plays an active role in

<sup>7</sup> Ibid, p. 17-19.

administering the law.

6. All states cover state and local public employees completely or partially, however, this coverage in some states is on an elective basis where as in other states the coverage is compulsory.

7. There is a great divergence among the jurisdictional laws as to what type of employment is covered. In one-fourth of the states, compensation laws apply mainly to listed "hazardous" or extra hazardous<sup>8</sup> employments.

a. In many states, employers of fewer than a stipulated number of employees are exempt from compensation law. However, most of these states permit voluntary acceptance.

b. In other states, numerical exemptions do not apply to certain employments.

B. Federal Employees' Compensation Act (FECA).<sup>9</sup>

This law plus the Longshoremen's and Harbor Workers' Act cover 3.3 million workers under the Federal compensation program. Both are administered by the Bureau of Employees' Compensation, Department of Labor. As noted previously, the FECA was the first compensation protection given Federal employees and the second compensation law enacted in the United States. After several revisions, the FECA has become one of the most liberal compensation laws.

1. The FECA covers both injury and disease related disabilities.
2. Medical payments are unlimited.
3. The FECA covers all rehabilitation costs in addition to regular compensation benefits.

<sup>8</sup> Accident Prevention Manual, op. cit., p. 11-4.

<sup>9</sup> Cheit, op. cit., p. 18.

4. Disabled workers receive two-thirds of the weekly wage up to \$121.15 per week, or three-fourths where there are dependents.

5. There is no duration or total dollar limits on indemnity payments to the totally disabled.

6. Benefits to the partially disabled are paid to according to a schedule of injuries.

7. Death benefits ranged from 45% to 75%, according to dependents, and are payable for the period of widowhood and minor dependency without total dollar limits. Both administrative and benefit cost of FECA are financed by Congressional appropriations.

C. Longshoremen's and Harbor Workers' Compensation Act.<sup>10</sup>

This law, which covers approximately one million workers, grew out of a problem posed by the longshoremen's status under maritime law. In accordance with a nineteenth century precedent, longshoremen were subject to maritime laws and were not eligible for state compensation benefits. This decision was based on the theory that whatever work is done to aid a ship in the performance of its mission, including loading or unloading freight and passengers, this work is a maritime service and thereby an area which does not come under state compensation laws. After several unsuccessful attempts to bring the workmen under a compensation law, Congress passed the Longshoremen's and Harbor Workers' Compensation Act in 1927.

1. The law covers both injury and disease related disabilities.

2. The law is not quite as liberal as the FECA although it compares favorably with state compensation laws.

<sup>10</sup>Ibid, p. 20.

a. Medical benefits are unlimited with limited rehabilitation costs.

b. Indemnity benefits provide a maximum dollar benefit of \$70 per week.

c. Permanent partial disability is limited to \$24,000.

d. There is no limit on permanent disability.

e. Death benefits range from 35% to 66 2/3% according to dependency and are payable for the duration of widowhood and dependency. Since private employment is involved, liability is privately insured. However, administrative costs are financed by Congressional appropriation.

C. Federal Employer's Liability Act (FELA).<sup>11</sup>

This law, which was first enacted in 1906, declared unconstitutional in 1908, and re-enacted once again one month after the FECA, covers approximately 1.1 million interstate railroad employees. The law was passed in response to deplorable working conditions which surrounded the railroad industry. The accident and/or death rate was,

1. One out of every 399 employees was killed (estimation).

2. For operating employees, the death rate was one in every

137.

3. The injury rate was one in 26.

The FELA, although amended twice, and has been subjected to considerable criticism, is still the basis for work injury compensation of interstate railroad employees. The FELA, does not provide for workmen compensation as previously discussed.

<sup>11</sup> Ibid.

1. The employer is responsible for damages to his employees for work related injuries, but only for those injuries which occur as a result of the employer's negligence.

a. The employer may not defend a suit on the grounds of fellow-employee's negligence.

b. The employer may not use the defense that employees assume normal risks with their employment (This common law defense was modified to its present condition in 1939).

2. Contributory negligence is a relevant issue.

a. Damage awards can be reduced to the extent that employee negligence can be proven.

3. Courts resolve the rights of the employer and employee for disagreements involving work-connected injuries.

The use of negligence as a basis for occupational disability compensation has been under continuous criticism. Strange as it may seem, the proposals for a workmen's compensation system have been rejected by the railroad workers themselves who contend that workmen's compensation would reduce their economic security.

D. The Jones Act and Admiralty Law.<sup>12</sup>

These two laws cover an estimated 87,000 seamen (defined as the "master and crew of any vessel in navigable waters") which represents the smallest occupational group with separate legal status for occupational disability compensation. The legal intricacies are far more complex since the employees are not only covered by two separate legal systems, admiralty and tort law; in addition benefits are also available under other statutes. This situation has led the National Association of Compensation Claimants' attorneys to refer to seamen

<sup>12</sup>Ibid, p. 23.

as "the most fortunate of all injured workers."<sup>13</sup>

E. State Employers' Liability and Tort Law. <sup>14</sup>

As previously noted, due to exclusions, exemptions, eligibility requirements etc. workmen's compensation coverage for all employees is far from complete. For these employees who are not covered, their only redress in cases of disagreement is the State Employers' Liability and Tort Laws. This means that,

1. The employee must file suit against his employer.
2. The common law defenses may be used against the employee.

Consequently, the delays, costs, etc. are only slightly smaller than when the procedure of undertaking a lawsuit for obtaining injury compensation was condemned a half century ago.

#### IV Methods of Complying with Compensation Laws.

A. Workmen's Compensation laws make the employer liable to his employee and requires that he take steps to guarantee payment of stipulated benefits. Methods of compliance are as follows:

1. Purchase of insurance from private companies.
2. Self-insurance.
  - a. Self insurance is permitted in most states for employers able to meet specified requirements.
  - b. Generally, only very large companies can self-insure and only then up to a certain amount after which coverage is by a private insurance company.
3. State insurance.

<sup>13</sup>Ibid, citing "The Tangled Seine," Yale Law Journal, Vol. 57 (1947), p. 243.

<sup>14</sup>Ibid, p. 24.

a. There are seven states<sup>15</sup> whose laws provide that insurance must be procured through a state fund.

## V Little Known Elements of Workmen's Compensation Laws.<sup>16</sup>

### A. Subcontractors' Employees.

1. Some states provide that a general contractor is responsible for compensation to employees of subcontractors.

2. The contractor is excused from this responsibility only if the subcontractors themselves have provided for their compensation obligations.

3. Therefore, obtaining evidence of workmen's compensation insurance from sub-contractors is a prerequisite.

### B. Employer's Liability.

As noted previously, many employees are not covered by compensation laws and have only the common law as a means of recovery for personal injury. Therefore, the employers workmen's compensation policy should include liability coverage.

1. It protects employers against suits by third parties who may have a right of action against the insured.

2. Liability coverage could be a necessity in those states having an elective compensation law. For example, if an employer elected to accept the law, and a few employees did not, the employer would be subject to common law action if an injury occurred to an employee who had not accepted the law.

3. Same principle applies in states making numerical exemptions to the compensation law.

<sup>15</sup> Accident Prevention Manual, op. cit., p. 11-12.

<sup>16</sup> Ibid, pp. 11-4 to 11-8.

C. Minors.

1. In most states, a minor, whether employed legally or illegally, is protected by workmen's compensation laws.
2. In cases of illegal employment, some states provide penalties of double compensation or afford the minor the right to sue for damages.

D. Extraterritorial Accidents.

1. Most of the compensation laws apply to injuries sustained outside their respective states while employees are engaged in temporary work.
2. Some states take jurisdiction of an injury occurring within its boundaries even though the employee's contact of hire was made in another state.
3. Due to the lack of uniformity in extraterritorial accidents, employers, whose employees work in different states, should provide coverage for all eventualities

E. Second Injury Funds.

1. Suppose an employee who has lost a member of his body, loses another and becomes permanently and totally disabled. He then becomes eligible for full payment for his combined disabilities.
2. If total cost of such compensation were imposed upon the last employer, handicapped persons might be refused employment.
3. To meet this problem, almost every state has statutory provisions for a second injury fund. These are financially supported by assessments levied on insurance companies, self-insurers, and in a few states, by appropriations out of general revenues.

4. Continuing the above example, the second member of his body is compensated by the employer and the difference between benefits for the combined disabilities and the benefits for the last injury is paid out of the second-injury fund.

#### F. Third Party Liability

1. An employee whose injury falls within the workmen's compensation statutes must accept the benefits provided in the law and cannot sue his company. However, there is nothing to prevent the employee from suing a third party whose negligence was the cause of the accident.

2. In practically every state, the right of an employee to sue a third party who is not connected with the employment, is stipulated in workmen's compensation statutes. However, the laws usually place some limit on the employee's rights to recover so that he cannot collect from both his employer and the third party.

a. In some states, the employer takes over the employee's right against third parties. Provision is then made for the employer to pay the employee any excess over the compensation paid to the latter.

b. In other states, an employee may proceed directly against the third party. If he recovers, the employee must reimburse the employer or insurance company for compensation benefits he has already received.

3. Defendants in third party suits have one defense known as the "Law of Contributory Negligence." If the injured employee has contributed in any degree to his own accident, this constitutes a complete defense for the defendant. However, this defense is receiving

less and less consideration by the courts because,

a. The jurors' lack of understanding the "Law of Contributory Negligence."

b. The injured's presence in the court room, who for example, may have lost a member of his body, tends to gain the sympathy of the jurors.

4. Third party liability suits have come into an age of their own. In the writer's home state, insurance companies were almost driven from the state due to the size of judgements which were being awarded against defendants, namely, industrial firms. This is a problem common to many states.

a. The size of the judgements range from \$100,000 to one judgement which slightly exceeded one million dollars.

b. In the final evaluation, it is the general public who pays for these seemingly excessive awards in terms of higher operating costs for industry.

5. The following is an actual case involving a third party liability suit. It not only illustrates the philosophy underlying third party claims but also illustrates the weakness of jury trials in cases of a technical nature. This particular suit also proved to be a test case as to the legality of contract indemnification clauses between a contractor and his employer relative to protection to the employer against third party suits.

In 1960, an electric utility company had hired a contractor for work on a 7,200 volt distribution circuit. During the course of the contract, one of the employees of the contractor received severe burns on his right hand and foot, both of which subsequently had to be

amputated.

Shortly after the accident, a claim was filed against the utility company by the employee of the contractor in the amount of \$353,000. The basis for the claim was the Common Law Codes (Chapter IV), i.e., the employer must provide safe tools, equipment, safety rules, etc. It is worthy to note that during this period, the employee was receiving state workman's compensation.

As noted in Chapter I, there are three Common Law defenses which could have been used by the utility company. The pertinent one in this case was the Law of Contributory Negligence which provides that an employer (the utility company) is not liable if an injured worker contributes in any way to his own accident. Therefore, the utility company's only defense was to prove that the employee had been negligent at the time of the accident. From the standpoint of a presentation to a jury, this is not an easy task because in this particular case, knowledge of back-feeding of a distribution transformer, construction standards, safe work methods on 7,200 volt distribution circuits, the National Electric Safety Code and other technical data was necessary for an understanding of the case. The ironic points were that the accident evolved from unsafe work practices which had been condoned by the workman's foreman, but the point had to be proven in court. Second, the injured workman had over twenty years experience in electric line work.

The law firm for the workman capitalized on this point that the jury would not be familiar with the technical aspects of the accident and preyed upon their emotions. In the summation of the case, the top attorney for the workman spent hours itemizing the costs that

would be incurred by the workman until the latter's death. The attorney dwelt in minute detail on the pain and suffering. This not only aroused the sympathy of the jury but also of the injured workman who was in the courtroom. Finally, the latter broke down and began sobbing hysterically and was carried from the court room. The defense attorney called for a mis-trial. After hours of argument, the judge over-ruled the defense attorney. The damage had been done and nothing said or done could erase the scene of a man with one leg and arm missing, being carried from the court room. The workman was awarded \$118,000.

There is one other point worthy of note and that is the Law of Contributory Negligence. Prior to the jury being excused to determine a verdict, the judge carefully expounded on the law in terms that any negligence on the part of the workman which may have contributed to the accident, would constitute a complete defense. The jury paid little attention to the judge's instructions. The juries in cases of this nature tend to perceive a corporation as a financial entity who can well afford to contribute to the economic loss of a workman. Lack of knowledge of the technical aspects of such cases, and the preying on the emotional instability of juries tend to alleviate the possibility of the latter rendering a purely objective verdict.

The case did not end at this point. When the contractor was employed by the utility company, he signed a contract and purchased insurance which was designed to indemnify and protect the utility company from third party claims. When the claim was levied against the utility company, the contractor and his insurer refused to stand back of the indemnification clause of the contract. So after the verdict was

rendered in favor of the injured workman, which was in this current year, a suit was filed against the contractor and his insuror in the amount \$145,000. This represented the utility company's loss in terms of the award, interest, litigation and administrative costs, etc. The utility company won the case in June 1965. The case was very important, because it established in the state concerned, the validity of such indemnification clauses in a contract. The clause had been placed in the contract because the utility company was aware of the lack of consideration given the Law of Contributory Negligence by juries.

#### G. Penalties.

1. In nearly every state the failure to furnish the required insurance is punishable by a fine and, in some cases, by imprisonment.

2. Additionally, in some states, the compensation payments may be increased, the privilege of doing business may be revoked, or the company may be liable for suit by the employee with defenses abrogated.

3. Failure to comply with state safety laws or codes results in increased compensation payments to the injured worker in some states.

#### VI Results of Workmen's Compensation.

This chapter has treated workmen's compensation from the viewpoint of its benefits to injured workers. Perhaps compensation laws' greatest success has been in motivating employers to reduce accident hazards and to take steps to insure safe operating practices in their firms.

The way workmen's compensation has been most effective in motivat-

ing employers toward safety programs, has been in making management see industrial injuries as a serious drain on profits of their companies. The identification plus the determination of these costs will be the subject of the following chapter.

## CHAPTER V

### DEVELOPMENT OF ACCIDENT COSTS

#### I Composition of Accident Costs.

##### A. What happens when an accident occurs?

1. The reply depends on magnitude.

a. In areas of minor injuries, it is the injured person, his foreman and probably one or two immediate employees who become concerned.

(1) Even to the layman, costs in terms of the foreman's time and time lost by the other employees who wish to render assistance, are evident.

b. In areas of major accidents, all factors are multiplied several times. For example, the writer once worked in a metal shop which employed approximately fifty employees. One of the employees had his hand completely severed by a punch press which was stamping holes in heavy guage metal.

(1) Within minutes, every employee had stopped work.

(2) Due to no medical facilities, three employees accompanied the man to the hospital.

What was the cost of the accident? In this case, the costs would be relatively easy to measure. However, in the following case, assignment of costs becomes more difficult. This is an example of an accident which appeared to be very minor initially, but soon evolved into a case of considerable cost.

Several years ago an electrician was putting nitrogen gas in a power line transformer (Nitrogen is used to blanket the oil to prevent air and moisture from entering the space at the top of a transformer

tank.). He picked up a steel bottle of nitrogen gas weighing about 45-50 pounds and placed it in its mounting on the side of the transformer tank. When he lifted, he felt a slight pain in his abdomen for a moment and then the pain was gone. He continued with his work. Later during the day, the pain reoccurred. A day or two later, he told the foreman about the experience. The foreman sent the electrician to a doctor who found a small abdominal hernia. A minor operation was performed and the workman returned to work. The doctor reported that his recovery had been considerably slower and more painful than the normal case. As is customary in cases of this kind, he was initially given light work.

The case did not end here. A few months later, the same injury occurred when handling less weight than the first time. The surgery was repeated again for an abdominal hernia. Recovery was again painfully slow. He returned to work and was placed on light duty. In a few months, the injury appeared again in spite of the fact that the doctor had cautioned him against any lifting.

Finally after the fifth operation and recovery, the man was placed on a job which would not subject him to any lifting. Today and several thousand dollars later, he is performing his job successfully in spite of a 25% disability rating.

2. It is the purpose of this chapter to present a method of cost analysis which will depict accident costs as a direct drain on profits. The discussion will begin with the determination of the classification of costs.

#### B. Cost Elements.

1. The two major classes of cost resulting from accidents are,<sup>1</sup>

<sup>1</sup>Rollen H. Simonds and John V. Grimaldi, Safety Management, p. 85.

a. Insurance costs.

b. Uninsured costs.

2. These classifications are not at present the most widely used expressions to classify accidents costs. Till 1956, writings had described costs as "direct" and "indirect," the former meaning the same as insurance costs and the latter meaning uninsured costs.

3. In 1956, the new classification titles were introduced and are gradually being adopted by writers and safety organizations, including the National Safety Council.

4. The traditional concepts of indirect and direct costs have not been entirely satisfactory because they are not sufficiently definitive.

a. "Direct costs" have usually referred to definite outlays of money, eg, compensation payments and medical expense.

b. "Indirect costs" have referred to those which do not represent definite outlays of money, but which are still reflected in increased costs of doing business.

c. These distinctions have been difficult to maintain, hence the reason for accepting the more precise terms "insured" and "uninsured" costs.

#### C. Elements of Uninsured Costs.

1. A number of years ago, a utility company line crew was doing work on a primary distribution circuit, 7,200 volts to ground, which had been switched out of service. During the period of work, the foreman instructed a lineman to reclose the disconnect, thereby energizing the circuit without informing the remainder of the crew.

Two other linemen not knowing the circuit was "hot" continued their work some distance from the foreman. A few moments

later, one of the two linemen made a head contact on the primary wire. He lost consciousness and as he fell (His safety belt was not fastened.), his body struck across the down guy wire and slid to ground.

Crew members who rushed to his assistance were successful in reviving him, although he was horribly burned. These resuscitation efforts had saved the man's life. He was immediately rushed to a hospital many miles away by fellow employees. Gangrene set in and one leg had to be amputated at the knee. His scalp was badly burned. He had literally been scalped electrically. There was bone damage to the skull.

For many months, the open burn on the top of the lineman's head was treated daily by a nurse coming from a hospital to his home. The surgeons had to stretch upward the skin on the sides and back of his head, in order for there to be skin to heal the wound.

Two years after the accident, the open wound on his head closed. Today, however, cataracts have begun to form on his eyes, probably as the result of the electric flash at the time of contact. So this case still is not closed medically after more than ten years. Costs as of now - many thousands of dollars.

The above represents only one facet of the accident. A member of management happened to be in the vicinity where the accident occurred and via car radio learned of the accident. He was on the scene shortly after the disaster. As might be imagined, crew members were themselves in a state of shock. They initially refused to return to work under the direction of the foreman.

A very thorough well documented investigation including photographs, sworn testimonies, checks on prior activities of the foreman, etc. was conducted at the Safety Director's level. A formal review

was conducted by top management. The recommendation was made to discharge the foreman. In this particular case, the final review was conducted by the President of the company who concurred with the recommendation.

Notwithstanding the overwhelming humanitarian aspects of this case, the foreman by one moment of thoughtlessness had placed on the company a life-time liability.

2. This case has been included to depict the scope and depth of the following elements of uninsured costs, which may be interpreted in terms of the above accident case for illustration purposes. In listing the uninsured costs,<sup>2</sup> only those that are subject to reasonably accurate measurement are included. Thus effects on employees' morale, costs to employ new employees, effect on public relations, etc. have been omitted as not measurable and/or difficult to connect with any one accident.

3. Cost of Wages paid for time lost by workers who were not injured.

a. These are employees who stopped work to watch or assist after the accident, who lost time because of equipment damaged in the accident, or who lost time because of the lack of production output by the injured.

b. This element approximates the following percentages in terms of total uninsured costs:

- (1) Lost time cases - 20%.
- (2) Doctor's cases - 9%.
- (3) First-aid cases - 1%.

<sup>2</sup>Ibid, p. 86.

4. The net cost to repair, replace, or straighten up material or equipment that was damaged in an accident.

a. Property damage is an obvious cost. However, the one point to watch is to ensure that the charge be confined to the net cost of repairing or putting in order material or equipment that has been damaged, or to the current worth of the equipment less salvage value if damaged beyond repair.

b. In terms of total uninsured costs, this element approximates the following percentages.

- (1) Lost time cases - 7%.
- (2) Doctor's cases - negligible
- (3) First-aid cases - negligible

5. Cost of wages paid for working time lost by injured workers, other than workmen's compensation payments.

a. Illustration of such costs are a matter of company policy, eg, difference between what the employee would normally receive, and his workmen's compensation benefits.

b. In terms of total uninsured costs, this element approximates the following percentages.

- (1) Lost-time cases - 27%.
- (2) Doctors cases - 55%.
- (3) First-aid cases - 21%.

6. Extra cost due to overtime work necessitated by an accident.

a. This charge is the difference between normal wages and overtime wages for the time needed to make up lost production, and

the cost of extra supervision, heat, light, etc.

b. In terms of total uninsured costs, this element approximates the following percentages.

- (1) Lost-time cases - 5%.
- (2) Doctors cases - negligible
- (3) First-aid cases - negligible

7. Cost of wages paid supervisors while time is required for activities necessitated by the accident.

a. This charge is based on wages paid the supervisor for time spent away from normal activities as a result of the accident.

b. In terms of total uninsured costs, this element approximates 6 percent in each injury class category.

8. Wage cost due to decreased output of injured worker after return to work.

a. For example, if there is a 40 percent reduction in the injured's output, the accident should be charged with 40 percent of his wages.

b. In terms of total uninsured costs, this element costs around 5 or 6 percent in lost-time and doctors cases, and about 1 percent in first-aid cases.

9. Cost of learning period of new worker.

a. If a replacement worker produces only one-half as much in the first two weeks as the injured worker would have normally produced, then half of the new employee's wages should be charged to the accident. The wage cost for time spent by the supervisor in training is also a valid charge.

b. This element is negligible in first-aid and doctors

cases and around 4 percent in lost-time cases.

10. Uninsured medical cost borne by the company.

a. This cost is usually that of medical services provided at the plant dispensary, or costs assumed by the company after maximum insurance payments.

b. In terms of total uninsured costs, this element approximates the following percentages.

- (1) Lost-time cases - 8%.
- (2) Doctor's cases - 19%.
- (3) First-aid cases - 60%.

11. Cost of time spent by higher supervision and clerical workers on investigations or in the processing of compensation application forms.

a. This charge represents time spent by supervision and by clerical employees in investigating an accident or settling claims.

b. This is not a significant factor in first-aid cases, but for doctors' cases and lost-time cases, the percentages are 28 and 17 percent respectively.

12. Miscellaneous unusual costs.

a. Examples are public liability claims, cost of renting equipment, loss of profit on contracts or orders cancelled, and demurrage.

b. In the study which supports the previously mentioned percentages, this element was found to be considerably less than 2 percent in each injury class categories.

D. Invalid Elements of Uninsured cost.

If accident cost analysis is to be understood and to

command the full credence, knowledge of not only valid elements of costs but also awareness of the invalid charges to an accident, is necessary. The following elements of cost, which have been suggested by various writers as typical accident costs, have been eliminated or very severely qualified on the bases of general invalidity, or valid only under special circumstances.

1. Cost of hiring new employee.

a. In large firms which continually provide a flow of new workers, the expense of hiring an employee on account of an accident, becomes exceedingly difficult to measure.

b. Of course, in small firms the above may not apply and hence the cost of hiring would be a valid charge.

2. Cost of subsequent injuries that occur in consequence of the excitement or weakened morale due to the original accident.

a. This would result in the counting of accident costs twice.

3. Cost due to loss of profit on the injured employee's productivity, and on idle machines.

a. The following conditions must all be present in order that there be a "loss of profit" on goods not produced as a result of accidents.<sup>3</sup>

(1) Accidents must cause a decrease in average rate of output or a considerable period of time.

(2) The resultant rate of output must be lower than desirable to maintain in view of product demand and variable costs

<sup>3</sup>Ibid, p. 94.

of production.

(3) The resultant output must cause a reduction in sales.

(4) Sales lost must not be recoverable at a later date.

4. Overhead cost which continues while the injured employee is a non-producer.

a. The only logical basis for charging overhead costs to an accident is if more equipment would be necessary to make up production lost due to accidents.

## II Accident Cost Determination.

As previously noted, there are two kinds of costs forced on a company by its industrial accidents, the insurance cost and the uninsured cost, the former being the easier to determine.

### A. Insurance Cost.

1. The insurance cost is the cost of workmen's compensation insurance required by law in each of the fifty states. Most firms carry this insurance with an insurance company, or with a state-operated fund.

a. For these firms, the insurance cost is the net amount of the insurance premiums.

b. The word "net" is necessary to reflect refunds in terms of dividends or rewards for good accident records.

2. Determination of insurance costs become more complicated for those companies who carry their own workmen's compensation insurance.

a. Some firms carry their own insurance only up to specified limits and are covered by an underwriter for any amount in excess of the prescribed limits.

B. Uninsured Cost.

Mr. H. W. Heinrich by his famous 4 to 1 ratio, has been credited for doing more than any other one person to make industry conscious of accident-caused production losses. The ratio is still referred to in many writings and is considered one of the basic philosophies of accident prevention. However, as Mr. Heinrich admits, the ratio does not apply to individual firms but to industry as a whole, and cannot be used as an accurate method of determining indirect (uninsured) costs for any one particular firm. Hence, the recent development of a more accurate method of determining uninsured costs is outlined below.

1. The basic principle of this new method is expressed in the following formula.<sup>4</sup>

Total cost = Insurance cost + A (number of lost-time cases) + B (number of doctors' cases) + C (number of first-aid cases) + D (number of no-injury accidents).

a. A, B, C, and D are constants indicating the average uninsured costs for each of the categories.

b. The classification of accidents in the formula are commonly used by safety engineers. The dividing lines between categories are as follows:<sup>5</sup>

1. Lost-time cases: (a) permanent partial disabilities and (b) temporary total disabilities.
2. Doctors' cases: (a) temporary partial disabilities and (b) medical treatment cases requiring the attention of a physician.

<sup>4</sup>Ibid, p. 112.

<sup>5</sup>Ibid, p. 113.

3. First-aid cases: medical treatment cases (a) requiring only first aid and (b) resulting in property damage of less than \$20 and in loss of less than eight hours of working time.
4. No-injury accidents: accidents that (a) either cause no injury or cause minor injury not requiring the attention of a physician and (b) result in property damage of \$20 or more or in loss of eight or more man-hours.

c. Fatalities and permanent total disabilities have been omitted from the categories since they are unusual and should be subject to a separate investigation rather than a part of a group whose uninsured costs are estimated by averages.

2. The average uninsured cost per each category should preferably be found by a study made in the concern for which costs are to be computed.

a. However, constants have been developed by R. H. Simonds, Ph.D., for certain industries.

(1) Use of these constants would probably require modification since they are based on 1962 wage levels.

3. For firms determining their own average uninsured costs, Figures I and II<sup>6</sup> are designed to assist in collecting cost data.

a. These cost reports were developed by Dr. Simonds and have been adopted for use by the National Safety Council.

4. Factors to consider in conducting studies are,

a. Ensure there is a complete understanding by supervisors and employees as to purpose of study, ie,

(1) Purpose is to determine average cost for each category of accident, not to compare foremen and/or departments.

b. Supervisors must be encouraged to report all accidents.

c. Ensure that the study covers sufficient number of cases

<sup>6</sup>Ibid, pp. 127-129.

so that the constant is representative.

(1) The mathematical test to help decide how many cases to investigate is the standard error formula.

d. Ensure that the study covers accidents that are representative of the firm.

(1) No conscious effort should be made by supervisors to select accidents for cost study, while omitting others.

(a) Supervisors might be inclined to omit more costly cases, thinking them less typical.

(b) Supervisors might be inclined to use only those cases in which they thought their handling of the matter showed up well.

e. A possibility of bias may exist due to the season at the time of the study.

(1) For example, some firms conduct work primarily out of doors.

(2) It may be desirable to break the study into two parts so as to sample two different seasons.

f. Variations in the level of company operations will effect items of cost, therefore, the study should be conducted when the firm is operating under typical conditions as to number of employees and output.

g. Catastrophe type accidents should be excluded from the study as not being representational.

(1) It is the accidents that are steadily occurring whose costs are the object of the study.

### III Conclusion

It is not of great importance to an organization to know

precisely, to the dollar, how much of its costs are attributable to its accidents. It would probably not pay as a permanent practice to set up and maintain all the accounts necessary to record separately all the accidents costs. What has been needed is a method of estimating total accident costs which will provide cost data sufficiently reliable and accurate to serve as a basis for managerial decisions. This chapter has presented such a method of estimation.

FIGURE I

DEPARTMENT SUPERVISOR'S ACCIDENT COST REPORT

Injury accident \_\_\_\_\_  
No-injury accident \_\_\_\_\_

Date \_\_\_\_\_ Name of injured worker \_\_\_\_\_

1. How many other workers (not injured) lost time because they were talking, watching, helping at accident? \_\_\_\_\_

About how much time did most of them lose? \_\_\_\_\_ hours \_\_\_\_\_ minutes.

2. How many other workers (not injured) lost time because they lacked equipment damaged in the accident or because they needed the output or aid of the injured worker? \_\_\_\_\_

About how much time did most of them lose? \_\_\_\_\_ hours \_\_\_\_\_ minutes.

3. Describe the damage to material or equipment. \_\_\_\_\_

Estimate the cost of repair or replacement of above material or equipment. \_\_\_\_\_

4. How much time did injured worker lose on day of injury for which he was paid? \_\_\_\_\_ hours \_\_\_\_\_ minutes.

5. If operations or machines were made idle: will overtime work probably be necessary to make up lost production? Yes ( ). No ( ). Will it be impossible to make up loss of use of machines or equipment? Yes ( ). No ( ).

Demurrage or other special nonwage costs due to stopping an operation. \_\_\_\_\_

6. How much of supervisor's time was used assisting, investigating, reporting, assigning work, training or instructing a substitute, or making other adjustments? \_\_\_\_\_ hours \_\_\_\_\_ minutes.

Name of supervisor \_\_\_\_\_

FIGURE II  
SAFETY DEPARTMENT  
INVESTIGATOR'S COST DATA SHEET

Lost-time \_\_\_\_\_  
(Permanent partial or temporary  
total disability)

Doctor's \_\_\_\_\_  
(Temporary partial disability or  
medical treatment case requiring  
outside physician's care)

First-aid \_\_\_\_\_  
(Medical treatment case requiring  
local dispensary care)

No-injury \_\_\_\_\_

Name \_\_\_\_\_

Date of injury \_\_\_\_\_ Its nature \_\_\_\_\_

Department \_\_\_\_\_ Operation \_\_\_\_\_ Hourly wage \_\_\_\_\_

Average hourly wage of workers in department where injury occurred \_\_\_\_\_

1. Wage cost of time lost by workers who were not injured, if paid by  
employer \_\_\_\_\_.

a) Number of workers who lost time because they were talking, watching,  
helping, \_\_\_\_\_.

b) Number of workers who lost time because they lacked equipment  
damaged in accident or because they needed output or aid of injured  
worker \_\_\_\_\_.

Average amount of time lost per worker, \_\_\_\_\_ hours \_\_\_\_\_ minutes.

2. Nature of damage to material or equipment.  
\_\_\_\_\_

3. Wage cost of time lost by injured worker while being paid by employer  
(other than workmen's compensation payments), \_\_\_\_\_.

a) Time lost on day of injury for which worker was paid, \_\_\_\_\_ hours  
\_\_\_\_\_ minutes.

FIGURE II (con't)

- b) Number of subsequent days' absence for which worker was paid, \_\_\_\_\_ days (other than workmen's compensation payments) \_\_\_\_\_ hours per day.
- c) Number of additional trips for medical attention on employer's time on succeeding days after worker's return to work \_\_\_\_\_.
- d) Additional lost time by employee, for which he was paid by company, \_\_\_\_\_ hours \_\_\_\_\_ minutes.
4. If lost production was made up by overtime work, how much more did the work cost than if it had been done in regular hours? (Cost items: wage rate difference, extra supervision, light, heat, cleaning for overtime.) \$ \_\_\_\_\_
5. Cost of supervisor's time required in connection with the accident, \$ \_\_\_\_\_.
- a) Supervisor's time shown on Department Supervisor's report, \_\_\_\_\_ hours \_\_\_\_\_ minutes.
- b) Additional supervisor's time required later, \_\_\_\_\_ hours \_\_\_\_\_ minutes.
6. Wage cost due to decreased output of worker after injury if paid old rate, \$ \_\_\_\_\_.
- a) Total time on light work or at reduced output, \_\_\_\_\_ days \_\_\_\_\_ hours per day.
- b) Worker's average percentage of normal output during this period \_\_\_\_\_.
7. If injured worker was replaced by new worker, wage cost of learning period, \$ \_\_\_\_\_.
- a) Time new worker's output was below normal for his own wage, \_\_\_\_\_ days \_\_\_\_\_ hours per day. His average percentage of normal output during time, \_\_\_\_\_ %. His hourly wage, \$ \_\_\_\_\_.
- b) Time of supervisor or others for training, \_\_\_\_\_ hours. Cost per hour, \$ \_\_\_\_\_.
8. Medical cost to company (not covered by workmen's compensation insurance), \$ \_\_\_\_\_.
9. Cost of time spent by higher supervision and clerical workers on investigation, including local processing of workmen's compensation application forms. (No safety or prevention activities should be included.) \$ \_\_\_\_\_

FIGURE II (con't)

10. Other costs not covered above (e.g., public liability claims; cost of renting replacement equipment; loss of profit on contracts canceled or orders lost if accident causes net reduction in total sales; loss of bonuses by company; cost of hiring new employee if the additional hiring expense is significant; cost of excessive spoilage by new employee; demurrage). Explain fully. \$ \_\_\_\_\_

Name of company \_\_\_\_\_

CHAPTER VI  
SAFETY AT THE STATE LEVEL

This syllabus has concentrated a portion of its emphasis on the state legislation necessary to ensure that the injured worker is adequately reimbursed for his economic loss. It is the intent of this final chapter to look at what states are doing to lower accident frequency, as opposed to paying for accident losses, and to examine the methods used in legislating and enforcing safety codes.

The following outline is based on information obtained from both Florida and California relative to their safety organizations and is believed, based on readings and interviews, to be representative of the majority of states except where noted.

I The Safety Organization.

A. The safety organization is normally a division of a larger department. In Florida, the safety division is in the Department of Industrial Commission. In California, the safety division is in the Department of Industrial Relations. The functions of such departments are oriented towards employees' welfare in terms of,

1. Fair Employment Practices.
2. Industrial Safety
3. Labor Law Enforcement.
4. Wages and Working Conditions.
5. Workmen's Compensation.

II Jurisdiction and Authority of the Safety Division.

A. The safety division has power and jurisdiction over every

place of employment except,

1. Maritime Workers on board ship.
2. Federal Employees.
3. Employees of interstate railroads.
4. Household domestics.

Note that the first three categories also have different types of workmen's compensation coverage per Chapter IV.

B. The safety division has authority,

1. To investigate disabling or fatal industrial injuries.
2. To ensure that places of employment are safe for employees and the public.
3. To prepare safety orders (Depends on authority granted by each state's legislative body.). For example, under Florida Statute 440.56, the Safety Division of the Florida Industrial Commission has prepared and now administers a total of 14 mandatory Safety Codes. In California, the state safety division has prepared and is currently administering 18 mandatory Safety Codes.

### III How Industrial Safety Orders are Developed.

A. There are two methods of creating safety orders,

1. Codes formulated by legislative action, which are actually laws.
2. Codes established by the state's safety division, which in a legal sense are not laws but have the effect and force of law.
  - a. As may be deduced, the process of legislating codes via legislative bodies proves to be a cumbersome and unwieldy process from the viewpoint of administration, enforcement, and constant

changes required to keep pace with technological progress.

b. In most states, authority has been granted to the safety division to formulate safety codes.

B. The need for safety orders is determined by either noting increases in accident frequency and severity rates of similar types of employment or by noting excessive compensation payments for accidents of a similar nature.

1. Some states have a labor statistics division which, among other functions, maintains data by type of accident and industry for use of the safety division.

C. The steps generally followed in those states where codes are established by the safety division are as follows.

1. The first draft is written by staff engineers. Assistance is obtained from many sources, eg.,

- a. Experts from the particular industry concerned.
- b. Safety codes of other states.
- c. National Safety Council.
- d. Underwriters Laboratories.
- e. National Bureau of Standards.
- f. Various agencies of the Federal Government.

2. The second major step is public hearings at which time comments and/or criticisms of management and labor are heard.

a. Comments are studied and reviewed and those considered of merit are incorporated into a revised draft of the proposed safety order.

3. The final step is the submission of the proposed code

to the state Industrial Safety Board, who by majority vote, will either approve or disapprove the proposal.

a. In California, after action by the Board, anyone may within twenty days formally petition for a rehearing. If the petition is granted, another public hearing is held. If no petition is filed within twenty days, the Board files the safety order with the Secretary of State, thirty days after which the order becomes automatically effective.

#### IV Enforcement

A. Codes written by a state safety division have the same force and effect as those safe practice procedures established by a state legislative body.

B. The two alternatives available to a state for enforcement of safety codes are:

1. Enforcement via law enforcement agencies.
2. Enforcement via field safety representatives.
  - a. As may be correctly deduced, utilization of properly qualified safety engineers is far superior to using regular law enforcement agencies if for no other reason than the requirement for technically qualified specialists. A brief examination of some of California's safety orders will make this point clear.

- (1) Aerial Passenger Tramway Safety Orders.
- (2) Boiler and Fired Pressure Vessel Safety Orders.
- (3) Electrical Safety Orders.
- (4) Logging and Sawmill Safety Orders.
- (5) Pneumatic Explosives Loading Safety Orders.

(6) Quarry and Open Pit Mine Safety Orders.

C. The actual authority of the field safety representatives extends from the mere notification of an unsafe working condition which is corrected by the employer, to the authority to close a firm, and if need be prosecute the employer.

1. Based on California statistics,<sup>1</sup> the Division of Industrial Safety each year,

a. Requires the elimination of about 180,000 unsafe working conditions.

b. Closes approximately 450 firms (pending compliance).

c. And initiates about 25 prosecutions.

D. To permit expeditious prosecution of safety code violators, the Florida State Legislature in 1963 enacted a law entitled "Expeditious Compliance" which permits field safety representatives to bring violators into a hearing within a matter of hours (instead of weeks).

1. Many of the violators are assessed fines (\$100.00 per day per violation) which in the writer's opinion are insignificant relative to the financial condition of some industries or contractors.

V Safety and Politics.

In 1958 the Florida Industrial Commission-Safety Division assisted by its Safety Advisory Engineering and Safety Code Committees created the "Crane Code". It was finally adopted by public hearing in spite of strong objection by a certain contracting group. Its use, supplemented by a continuing educational program has gradually become more and more effective, in spite of the fact that the use of cranes and

<sup>1</sup>California Safety News, June 1964.

and draglines had grown tremendously.

The above is cited only to illustrate that special interest groups have and will continue to employ lobbying forces in an effort to acquire gains under the guise of safety for certain selfish interests. At certain locations, there have been codes already adopted and legislation passed which increases rather than decreases accident frequency. Safety and politics do not mix. It behooves industry to be continually on the alert to this back door approach to safety.

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